APPENDIX I

NOISE STUDY REPORT

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Information developed for this Appendix is used to describe the existing conditions and associated impacts on alternatives carried forward for analysis in the N-12 Draft EIS. This technical memorandum was developed prior to completion of alternative screening and alternative refinement. Alternative 1 within the Noise Study relates to the on-alignment alternatives (Alternative A1 and Alternative A2 as presented in the DEIS). Alternative 2 within the Noise Study relates to the base of the bluffs alternative (Alternative A3 and Alternative A7 as presented in the DEIS). Alternative 3 within the Noise Study relates to the bluffs alternatives (Alternative B1 and Alternative B2 as presented and subsequently dismissed from detailed analysis in the DEIS).

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Nebraska

Memorandum

Department of Roads **Project Development** **Noise and Air Studies**

DATE: February 2, 2012

TO: Len Sand, Planning and Project Development

FROM: Mark Ottemann, Noise and Air Studies Engineer, Planning and Project Development

SUBJECT: Niobrara East and West newly proposed alignment, C.N. 31674, STPD-12-5(1011)

The Noise and Air section of Planning and Project Development at the Nebraska Department of Roads (NDOR) has received and reviewed the following newly proposed alignment:

Niobrara East and West (C.N. 31674, STPD-12-5(1011)) Alternative B2, south of bluffs alignment

This particular alignment begins just east of Verdel and continues south of the other proposed alternatives well into the bluffs and ends at Niobrara State Park. Based on a previous study of noise in the area, as with the other studied alignments, no residences along the proposed alignment lie within the 66 dBA contour (residential impact). In addition there are low levels of traffic and a lack of noise sensitive receivers in the area. Therefore, NDOR finds no need for an additional noise study of the newly proposed alignment or any future proposed alignments within the study corridor.

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NOISE STUDY REPORT

December 9, 2008

PROJECT NO. STPD-12-5(115), C.N. 31674
Niobrara East and West
Knox County, Nebraska

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PROJECT BACKGROUND

This report documents the noise analysis completed in support of the Nebraska Dept. of Roads (NDOR) Niobrara East and West Project. The proposed roadway project is located on Highway N-12 and consists of three parts located east and west of Niobrara, Nebraska. The first part is located west of Niobrara beginning at **RP 151.48** and ending at **RP 157.21**. The second part is also located west of Niobrara beginning at **RP 159.83** and ending at **RP 160.27**. The third and final part of the project is east of Niobrara beginning at **RP 162.30** and ending at **RP 167.21**. The length of the first segment is 5.73 miles, the second segment is 0.44 miles and the third segment is 4.91 miles. The total project length is 11.08 miles.

The existing alignment of Highway 12 is a two-lane roadway that rests on a flood plain of the Missouri River in Knox County, Nebraska. On several occasions the highway has been covered with flood waters from the Missouri River and nearby creeks. The proposed improvements include raising the elevation of the road and three options for a change in alignment. The first proposed alignment follows closely the existing route of Highway 12. The second proposed alignment consists of moving Highway 12 further south away from the Missouri River to the base of the hills adjacent to the flood plain. The third and final proposed alignment involves moving Highway 12 slightly further south than the second alignment placing the road up into the hills adjacent to the flood plain.

The purpose of this noise report is to:

- Provide a discussion of the fundamentals of noise and traffic noise analysis.
- Evaluate existing traffic noise levels in the corridor.
- Predict the traffic noise levels associated with each proposed alignment change for identified sensitive receivers. Sensitive receivers are used adjacent to the studied corridor (such as houses, businesses, parks and schools) that might be affected by traffic noise.
- Identify the typical distance from the roadway at which noise levels would be predicted to approach the Federal Noise Abatement Criteria (NAC) noise levels of L_{eq} 67 dBA and 72 dBA. “Approaching” this level is defined by NDOR policy as a noise level within one decibel of the NAC.
- Quantify the number of properties that are predicted to experience roadway noise levels that exceed the applicable standards.
- Evaluate potential mitigation measures for sensitive receivers adjacent to the new alignment that approach or exceed the NAC.

NATURE OF NOISE

Noise may be defined as unwanted sound. Sound is the sensation produced when the movement of an object creates vibrations, or waves, that pass through the ears. The relative impact of sound waves depends on the amount of pressure they generate. The unit of measure for sound pressure is the decibel (dB). Decibels are based on a logarithmic scale because the range of sound pressures is too great to be accommodated on a linear scale. The range of sound pressure levels most frequently encountered in evaluating traffic-generated noise on highways is 50 to 95 dB.

The measured noise level from a given source does not necessarily correspond to our perception of "loudness." For instance, a three (3) decibel increase from a noise source represents a doubling of the noise level (as measured in sound pressure) on the logarithmic scale. However, this change is barely perceptible for human beings. Furthermore, an increase in 10 decibels from a noise source is a tenfold increase in noise pressure, but is only perceived as a doubling in the loudness by the human ear.

For highway traffic noise analysis, the Federal Highway Administration (FHWA) has specified that noise be predicted and evaluated in decibels weighted with the A-level frequency response; this unit of measure is referred to as dBA. Measurements in dBA incorporate a human's reduced sensitivity to both low frequency and very high frequency noises to better correlate with our subjective impression of loudness.

Table 1 displays noise levels common to everyday activities.

TABLE 1. Common Exterior Noise Levels (dBA)

Common Noise Levels	Noise Level (dBA)
Rock Band at 16 ft	110
Jet Flyover at 985 ft	105
Gas Lawn Mower at 3 ft	95
Diesel Truck at 50 ft	85
Same Truck at 110 ft	80
Gas Lawn Mower at 100 ft	70
Normal Speech at 3 ft	65
Birds Chirping	50
Leaves Rustling	40
Very Quiet Soft Whisper	30
Threshold of Hearing	0

23 CFR Part 772 Standards

23 Code of Federal Regulations (CFR) Part 772 was written by the Federal Highway Administration (FHWA). Its purpose is to provide procedures for noise studies, and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for traffic noise information to be given to those officials who have planning and zoning authority in the project area. 23 CFR 772 contains noise abatement criteria, which are based on the equivalent level (L_{eq}), noise descriptor. L_{eq} (h) is the equivalent steady state sound level, which during the hour under consideration contains the same acoustic energy as the time-varying traffic sound level during that same hour. The following table contains the upper limits of hourly L_{eq} desirable noise levels that are part of the noise abatement criteria established by 23 CFR 772. Any noise levels that approach or exceed these criteria would not be desirable and would be referred to as a noise impact.

TABLE 2. Noise Abatement Criteria, Hourly A-Weighted Sound Level

Activity Category	Hourly Noise Levels L_{eq} (h) dBA	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, play grounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

The selection and analysis of all individual noise sensitive receptors are based on the data included in the above table. Most areas come under Activity Category "B" or "C". Activity "C" mostly pertains to commercial land use or business offices, but would not necessarily include such things as a factory, machine shop or a service station. Also, storage buildings or warehouses are not usually considered to be noise sensitive. Primary consideration is to be given to exterior areas; therefore, all noise levels referred to in this study are exterior noise levels unless otherwise stated. Activity Category "E" is not normally used since interior noise depends on the type of windows, doors or wall structures of each building; however, sometimes a specific receptor might warrant its use.

NOISE PREDICTION METHOD

Traffic noise levels associated with five different scenarios were predicted for this noise study:

- ***The Existing Conditions Scenario*** assumed current (2012) traffic volumes, vehicle mix (broken down by autos, medium trucks and heavy trucks) and roadway characteristics.
- ***The 2034 No-Build Scenario*** assumed that future (2034) forecasted traffic would be traveling on the existing Highway N-12 without a change in alignment or road elevation.
- ***The 2034 Build Scenario of Alternative Alignment 1*** assumed that future (2034) forecasted traffic would be traveling on the constructed Highway-12.
- ***The 2034 Build Scenario of Alternative Alignment 2*** assumed that future (2034) forecasted traffic would be traveling on the constructed Highway-12.
- ***The 2034 Build Scenario of Alternative Alignment 3*** assumed that future (2034) forecasted traffic would be traveling on the constructed Highway-12.

(S-54D and N-14 traffic were also incorporated into the model as these highways produce significant noise in this corridor).

Traffic noise levels shown in this study resemble “peak hour” noise levels and are predicted in hourly L_{eq} dBA. The L_{eq} descriptor is reliable for low volume as well as high volume roadways, is simpler in most instances for highway designers to work with, and is more flexible in terms of permitting noise levels from different sources to be included in the analysis of the total ambient noise.

The "FHWA Highway Traffic Noise Prediction Model" is the method used in this report to predict L_{eq} dBA noise levels. This method was developed and approved for use by the U.S. Department of Transportation Federal Highway Administration. The procedures included in the

FHWA Model permit an analysis of variations in traffic noises in terms of traffic parameters, roadway and observer characteristics. These parameters are then identified for a particular traffic situation and transformed into noise level estimates through the use of this prediction method, which has been set up on a computer, using the FHWA Traffic Noise Model (TNM) Version 2.5.

NOISE MODEL PARAMETERS

The following parameters were considered when applying the traffic noise prediction methodology:

- Traffic levels, vehicle composition (whether auto, medium truck or heavy truck)
- Posted speed: 60 mph on N-12 west of Niobrara, 35 in the town of Niobrara increasing to 50 just as the road heads out of town. 55 mph beginning east of Niobrara and increasing to 60 mph to the east of N-14. Design Speed of Highway 12: 60 mph.
- Plan and profile information for roadways
- Location and elevation of sensitive noise receivers by activity category
- Location of terrain and man-made features that act to shield traffic noise
- Ground cover type

TRAFFIC PARAMETERS

The traffic volume used for this hour time period is usually the Design Hourly Volume (DHV) traffic. However, if the DHV is not that predictable, a peak hour volume that occurs on a regular basis during design year might be used. Heavy trucks include all vehicles having three or more axles, generally having a gross vehicle weight greater than 26,000 lbs. Medium trucks include all vehicles having two axles and six wheels, generally having a gross vehicle weight greater than 10,000 lbs but less than 26,000 lbs. The following diagram shows traffic volumes used on this project.

TABLE 3. Traffic Data

	Highway Number	Average Daily Traffic	Design Hourly Volume
Exisiting (2012)	N-12 west of Niobrara near Verdel	454	48
	N-12 east of Verdel Landing intersection	870	91
	N-12 east River Front DU	932	98
	N-12 east of Niobrara	1754	184
	N-12 east N-14 intersection	1408	148
	N-14	858	90
	S-54D	860	90
	N-12 east of Santee Casino	1420	148
	Bridge west of Niobrara	1140	119

No-build and Alternate Alignment 1 and 2 (2034)	N-12 west of Niobrara near Verdel	530	56
	N-12 east of Verdel Landing intersection	988	104
	N-12 east River Front DU	1066	112
	N-12 east of Niobrara	2410	253
	N-12 east N-14 intersection	1882	198
	N-14	1448	152
	S-54D	1416	149
	N-12 east of Santee Casino	2510	226
	Bridge West of Niobrara	1066	112
	N-12 west of Niobrara lower	514	54
	N-12 west of Niobrara upper	474	50
	N-12 east of River Front DU	1066	112
	N-12 east of Niobrara lower	2410	253
Alternate Alignment 3 (2034)	N-12 east of Niobrara lower east of N14	1414	148
	N-12 east of Niobrara upper	458	48
	N-14	1448	152
	S-54D	1416	149
	N-12 after Santee Casino	2150	226
	Bridge west of Niobrara	1066	112

Percent heavy commercial vehicles = 9%. National average used for classification splits.

TABLE 4. Noise Levels at Project Receptors

NOISE LEVELS AT PROJECT RECEPTORS (dBA)											
Receptor ID & Land Use Residential (R) Commercial (C)	**Distance from Centerline (Feet) Existing and Alternative Alignments**				**Existing Noise Level**	**No-Build Noise Levels**	**Build Noise Levels**			**L_{eq} Noise Abatement Criteria**	**Approach or Exceed L_{eq} Criteria**
	Existing	**Alt 1**	**Alt 2**	**Alt 3**			**Alt 1**	**Alt 2**	**Alt 3**		
1 – R	165	165	165	165	48	48	48	48	48	66	No
2 – R	225	225	225	225	48	48	48	48	48	66	No
3 – R	607	577	577	644	48	48	48	48	48	66	No
4 – R	607	565	565	686	48	48	48	48	48	66	No
5 – R	789	729	770	400	48	48	48	48	48	66	No
6 – R	1055	995	588	590	48	48	48	48	48	66	No
7 – R	1094	1154	3357	4220	48	48	48	48	48	66	No
8 – R	420	380	120	1194	48	48	48	59	48	66	No
9 – R	166	166	178	758	54	55	55	54	51	66	No
10 – R	1368	1368	1368	1396	48	48	48	48	43	66	No
11 – C	1391	1391	1391	1453	48	48	48	48	49	71	No
12 – C	268	268	268	286	48	50	50	50	56	71	No
13 – C	365	365	365	365	48	48	49	48	56	71	No
14 – C	165	165	165	165	52	54	54	53	54	71	No
15 – R	350	350	350	350	48	49	49	49	59	66	No
16 – R	170	170	170	170	51	53	54	53	54	66	No
17 – R	112	112	112	112	54	56	57	56	57	66	No

18 – R	268	268	268	268	48	49	50	49	51	66	No
19 – R	223	223	223	223	48	50	51	50	51	66	No
20 – R	323	323	323	323	48	48	48	48	52	66	No
21 – R	500	420	420	395	48	48	48	49	49	66	No
22 – R	910	850	216	1602	48	48	48	57	55	66	No
23 – R	850	787	205	1650	48	48	48	57	49	66	No
24 – R	353	424	1000	2863	54	56	56	54	56	66	No
25 – R	307	380	936	2810	52	53	53	52	53	66	No
26 – R	532	590	590	568	49	51	51	51	50	66	No
27 – R	140	220	220	220	58	60	58	56	51	66	No
28 – C	380	470	470	485	48	49	48	48	48	71	No
29 – C	404	486	486	500	48	49	48	48	48	71	No
30 – R	153	135	135	150	56	58	58	59	60	66	No

Table 4 lists all those noise sensitive receptors within the limits of this project adjacent to N-12. The table details the following: distance of each receptor from the existing and proposed project centerline (centerline of N-12), computed noise levels in hourly L_{eq} dBA for the existing system (2012 traffic volumes), and computed noise levels in hourly L_{eq} dBA for future design year 2034 (no-build and build alternatives). Also shown are the hourly L_{eq} dBA noise abatement criteria that are part of the 23 CFR Part 772 guidelines used in determining a noise impact.

Some of the receivers were placed in areas where the existing noise levels determined by TNM were unrealistically low. If In this case N-12 was aligned closer to a receiver, TNM could show a substantial increase in noise levels which would not be realistic. Under natural conditions birds chirping, leaves rustling, and the wind – factors not accounted for in TNM – will cause noise levels in the most serene places to be in the 40 dBA range. To correct this flaw, a noise meter was used to calculate the background noise levels at several serene locations in the Niobrara area. The average noise level was determined to be 48 dBA which was used for background existing levels. Any existing noise level TNM found to be lower was corrected. Aerial 4A illustrates where noise readings were taken and the dBA reading for each site.

TRAFFIC NOISE ANALYSIS

In analyzing the preceding traffic noise table, emphasis will be given to the two main noise criteria of a traffic noise impact as set forth in 23 CFR 772. A comparison will be made between the predicted traffic noise levels and the noise abatement criteria (NAC) to determine if a traffic noise impact exists due to the noise levels approaching or exceeding the criteria. Also, a comparison will be made between existing noise levels and future predicted traffic noise levels to determine if a noise impact occurs due to a substantial increase in noise.
Nebraska Department of Roads generally considers that an impact occurs and abatement measures will be considered for receptors if:

1. The predicted design year noise levels approach or exceed the noise abatement criteria (NAC). NDOR has established that a noise level of one decibel less than the NAC in the FHWA Noise Standards constitutes “approaching” the NAC.

2. Predicted future noise levels are 15 dBA or more above existing levels. For purposes of interpreting the FHWA noise standards, this would be considered “substantially exceeding” existing levels.

PREDICTED NOISE LEVELS

The primary tasks for the noise study were to identify receivers that approached or exceeded the NAC and to determine the relative change in traffic noise levels anticipated due to the changed in alignment. Noise levels were predicted for existing conditions (2012), 2034 no-build conditions, and 2034 build conditions. TNM was applied using the appropriate roadway, traffic and sensitive receiver information to predict the noise levels for each of the scenarios.
The predicted noise levels are summarized as follows:

- There are no instances of build condition noise levels substantially exceeding no-build condition noise levels in the study area (increase of 15 dBA over the existing levels).
- 2034 no-build noise levels increased between zero (0) and two (2) dBA compared to existing levels (2012).
- The difference in predicted noise levels between the 2034 no-build and build scenarios varied depending on the change in Alignment. Some receivers experienced a slight increase in dBA when an alignment was moved closer to the receivers, while dBA decreased as an alignment moved further away from the receivers.

Typical 2034 build scenario noise impact contours of L_{eq} 66 dBA and L_{eq} 71 dBA were generated for this analysis. The uses that fall within these contours represent a noise level approaching (within one decibel) the NAC for Activity Category B and C uses. The typical distance to the edge of the noise impact contour may vary significantly throughout the corridor due to changes in terrain, some variation in traffic levels and changes in vehicle speed. The typical noise contours were generated to represent conditions where the roadway and receiver are at the same elevation with a direct line-of-sight between the roadway and receiver. For this reason, in some locations the actual width of the noise impact contour may differ from those documented in Table 4.

TABLE 5. Typical Noise Impact Contour Widths, 2034 Build Condition Scenario

Typical Noise Contour Distance from Build Condition Centerline of N-12			
	Alternative 1	**Alternative 2**	**Alternative 3**
East of Verdel	66 dBA = 15 ft	66 dBA = 15 ft	66 dBA = 15 ft
	71 dBA = <15 ft	71 dBA = <15 ft	71 dBA = <15 ft
East of Verdel Landing	66 dBA = 25 ft	66 dBA = 25 ft	66 dBA = 15 ft
	71 dBA = <15 ft	71 dBA = <15 ft	71 dBA = <15 ft
Southeast of River Front DU	66 dBA = 25 ft	66 dBA = 25 ft	66 dBA = 15 ft
	71 dBA = <15 ft	71 dBA = <15 ft	71 dBA = <15 ft
In Niobrara	66 dBA = 20 ft	66 dBA = 20 ft	66 dBA = 20 ft
	71 dBA = <15 ft	71 dBA = <15 ft	71 dBA = <15 ft
East Edge of Niobrara	66 dBA = 35 ft	66 dBA = 35 ft	66 dBA = 35 ft
	71 dBA = <15 ft	71 dBA = <15 ft	71 dBA = 15 ft
East of Niobrara	66 dBA = 55 ft	66 dBA = 55 ft	66 dBA = 55 ft
	71 dBA = 20 ft	71 dBA = 20 ft	71 dBA = 20 ft
East of N-14	66 dBA = 45 ft	66 dBA = 45 ft	66 dBA = 45 ft
	71 dBA = 15 ft	71 dBA = 15 ft	71 dBA = 15 ft
Southeast of Casino	66 dBA = 50 ft	66 dBA = 50 ft	66 dBA = 50 ft
	71 dBA = 20 ft	71 dBA = 20 ft	71 dBA = 20 ft

While the noise contours illustrated in Table 5 and the Aerials do not illustrate any variation in impact width due to locations of noise shielding, the estimated noise levels at each receiver (Table 4) do account for location-specific shielding where appropriate.

NOISE ABATEMENT MEASURES

According to NDOR Policy, noise abatement measures should be considered where predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed the existing noise levels. In this case, abatement measures were not considered because future build noise levels along the construction did not approach or exceed the NAC.

When considering abatement measures, judgments are made in each area, weighing the costs and effects of each abatement measure against the amount of benefit. Even if a noise abatement measure is feasible, it might not be reasonable or warranted for a particular area.

Buffer Zones: The purpose of a buffer zone is to provide enough distance between the noise source and any future developments in order to minimize future noise impacts. Buying substantial right-of-way in undeveloped areas adds that extra distance to allow for more noise reduction.

Alteration of Horizontal and Vertical Alignment: This noise abatement measure can be incorporated into a project to reduce traffic noise impacts where the receptors are typically on one side of the project or where the elevation is relatively constant. Since sound intensity decreases with distance, shifting of the centerline away from the receptors may reduce noise levels. For this specific project altering the vertical alignment is not practical for noise abatement.

Traffic Management Measures: These measures must be examined and evaluated as alternative noise abatement measures for reducing or eliminating any noise impact.

The prohibition of certain vehicle types, mainly trucks, is an alternative noise abatement measure. Another measure might be to limit trucks to only daylight hours. However, these measures are not reasonable for this project because this is a highway facility, one of whose purposes is to move traffic including trucks, easily through the area.

Earth Berm: An earth berm can be incorporated into a project to help minimize traffic noise levels. The earth berm can be placed between the impacted receivers and the roadway in areas where a structural noise barrier would not be a reasonable option. This type of abatement measure is not only effective for reducing noise levels but can be aesthetically pleasing as well.

Noise Barriers: Barriers are considered as a possible means of noise abatement where traffic noise from a new or widened roadway is predicted to impact adjacent uses. Barriers are considered effective when blocking the “line of sight” between the noise source and the noise receiver. A noise barrier must be continuous and have substantial length and height to be effective. When possible, noise barriers should be designed to extend approximately four times as far in each direction as the distance from the sensitive receiver to the barrier. Noise barriers are not proposed unless a single barrier at a feasible location can effectively reduce traffic noise at several impacted receptors for a reasonable cost.

According to Nebraska Department of Roads (NDOR) policy, a noise barrier will be considered ***feasible*** if it can meet all four of the following criteria:

1. Be built to fit the topography
2. Achieve at least a 5-decibel noise reduction
3. Be built 16 feet high or less
4. Be located beyond the clear recovery zone

Barrier mitigation at the site is not considered feasible if a site cannot meet all four of the feasibility criteria. If a noise barrier meets the criteria for feasibility, it is then evaluated for its' reasonableness.

A noise barrier will be considered ***reasonable*** according to NDOR policy if it meets a given score based on four criteria, which are judged on a point scoring system. Barriers with a total score of less than 10 are judged to be <u>not</u> reasonable. Barriers with a score of 10 or above should be evaluated further. The unit base price for the noise wall construction is estimated to be $30 per square foot. The reasonableness test criteria and their scores are as follows:

1. Cost effectiveness defined as dollars per protected residence.
   - < $18,000/residence = 4
   - $18,000-23,000/residence = 3
   - $23,000-28,000/residence = 2
   - $28,000-30,000/residence = 1

2. The change in computed noise levels between the design year (without abatement) and the existing will equal or exceed 3 decibels (a barely perceptible change).
   - > 3 dBA = 4
   - 3 dBA = 3
   - 2 dBA = 2
   - < 2 dBA = 1

3. The housing development preceded initial highway construction.
   - > 80% = 4
   - 50-80% = 3
   - 30-50% = 2
   - < 30% = 1

4. It is considered unreasonable to provide noise abatement on a highway with partial or no control of access.
   - Full control of access = 4
   - 1/2 mile access control = 2
   - 1/4 mile access control = 1
   - < 1/4 mile access control = 0

ASSESSMENT BY LOCATION

No receiver locations within the scope of the project approached or exceeded the Noise Abatement Criteria, nor did any receiver's noise level substantially increase (15 dBA over the existing levels).

DETOUR NOISE

The project will utilize the existing alignment as a detour for any future build scenarios. Noise levels would remain the same as traffic numbers and flow will not be significantly changed.

CONSTRUCTION NOISE

The evaluation and control of construction noise must be considered as well as the traffic noise. This project is bordered by mostly residential properties and a couple businesses. The noise sensitive receptors that are located directly adjacent to this project are those that are of major concern in this study of construction noise. These same receptors were also of concern in the traffic noise study.

The following are some basic categories of mitigation measures for construction noise.

Design Considerations: This includes measures in the plans and specifications to minimize or eliminate adverse impacts. Because the existing noise sensitive receptors are on both sides of the roadway, nothing can be done to minimize or eliminate construction noise through changes in design.

Community Awareness: It is important for people to be made aware of the possible inconvenience and to know its approximate duration so they can plan their activities accordingly. It is the policy of the Nebraska Department of Roads that information concerning the upcoming project construction be submitted to all local news media.

Source Control: This involves reducing noise impacts from construction by controlling the noise emissions at their source. This can be accomplished by specifying proper muffler systems, either as a requirement in the plans and specifications on this project or through an established local noise ordinance requiring mufflers. Contractors generally maintain proper muffler systems on their equipment to ensure efficient operation and to minimize noise for the benefit of their own personnel as well as the adjacent receptors.

Site Control: Site control involves the specification of certain areas where extra precautions should be taken to minimize construction noise. One way to reduce construction noise impact at sensitive receptors is to operate stationary equipment, such as air compressors or generators, as far away from the sensitive receptors as possible. Another method might be placing a temporary noise barrier in front of the equipment. As a general rule, good coordination between the project engineer, the contractor, and the affected receptors is less confusing, less likely to increase the cost of the project, and is a more personal approach to work out ways to minimize construction noise impacts in the more noise-sensitive areas. No specific construction-noise, site-control specifications will be included in the plans.

Time and Activity Constraints: Limiting work hours on a construction site can be very beneficial during the hours of sleep or on Sundays and holidays. However, most construction activities do not occur at night and usually not on Sundays. Exceptions due to weather, schedule, and a time-related phase of construction work could occur. No specific constraints will be incorporated in the plans of this improvement. Enforcement of these constraints could be handled through a general city or county ordinance, either listing the exceptions or granting them on a case-by-case basis.

SUMMARY

Land use adjacent to this project is primarily agricultural, with occasional commercial or residential receivers. The noise level table on page seven of this report shows that none of the 30 receptors analyzed have a noise impact in the year 2034 build situation due to noise levels approaching or exceeding the NAC. Noise Abatement measures were not analyzed as no receivers were impacted.

The noise impact contours of 66 dBA and 71 dBA were generated for this analysis, because they represent a noise level approaching (within one decibel) the NAC for Activity Category B and C uses. The contours are a general reference and do not take into consideration shielding factors from buildings. Noise levels for specific areas or receivers are shown in Table 4 on page 7.

In the event that any changes in the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

REFERENCES

23 Code of Federal Regulations (CFR) Part 772 was used throughout the study.

Predicted noise levels were based upon the method presented in FHWA-RD-77-108 "FHWA HIGHWAY TRAFFIC NOISE PREDICTION MODEL."

Nebraska Department of Roads “Noise Analysis and Abatement Policy,” May, 1998.

The introductory section of this study was taken in part from "Guide on Evaluation and Attenuation of Traffic Noise" prepared by American Association of State Highway and Transportation Officials. It is included to familiarize the reader with some of the basic technical terminology and to discuss the guidelines and standards used in the development of the report.

Methods for evaluation and control of construction noise were taken from the FHWA Special Report - 'Highway Construction Noise: Measurement, Prediction and Mitigation'.

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Niobrara East and West

Alternative 1

N

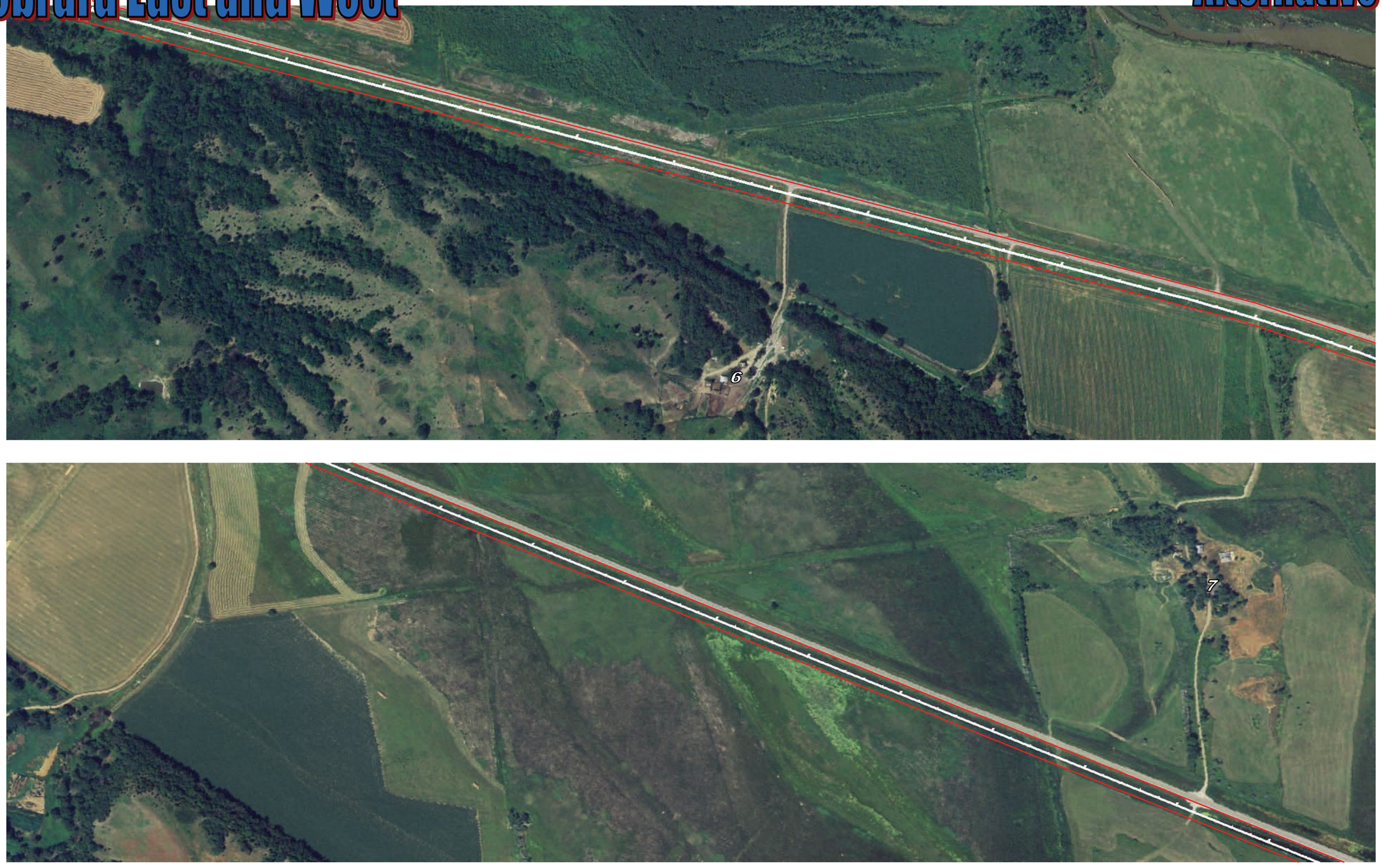
66 dBA

71 dBA

1A

Niobrara East and West

Alternative 1



1B

66 dBA

71 dBA

Niobrara East and West

Alternative 1

N

66 dBA

71 dBA

1C

Niobrara East and West

Alternative 1

N

15
13
14
12
16
18
20
17
19
21

66 dBA
71 dBA

1D

Niobrara East and West

Alternative 1

N

1E

66 dBA

71 dBA

Niobrara East and West

Alternative 1

N

66 dBA

71 dBA

1F

Niobrara East and West

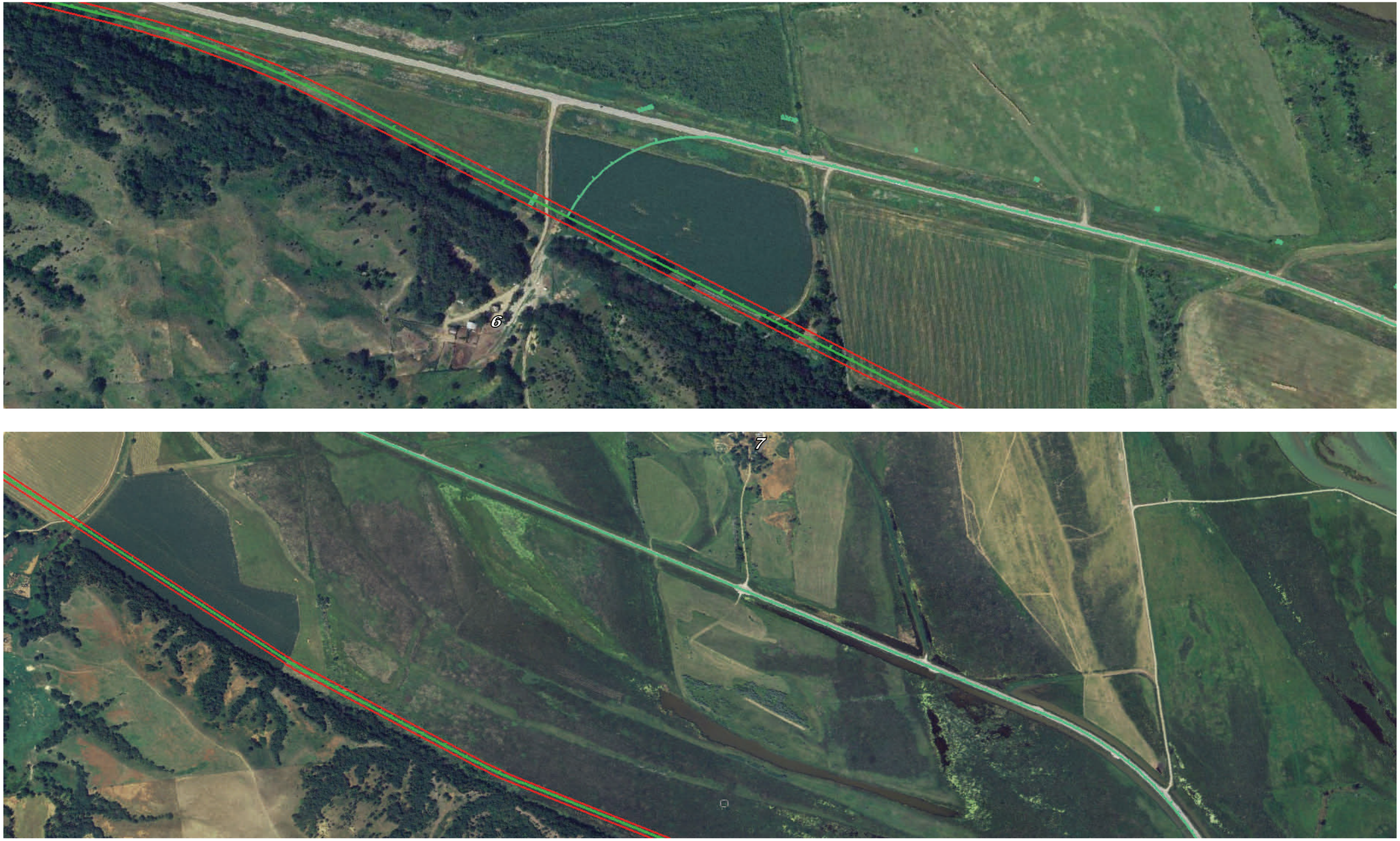
Alternative 2

2A

Niobrara East and West

Alternative 2

N



66 dBA

71 dBA

2B

Niobrara East and West

Alternative 2

N

66 dBA

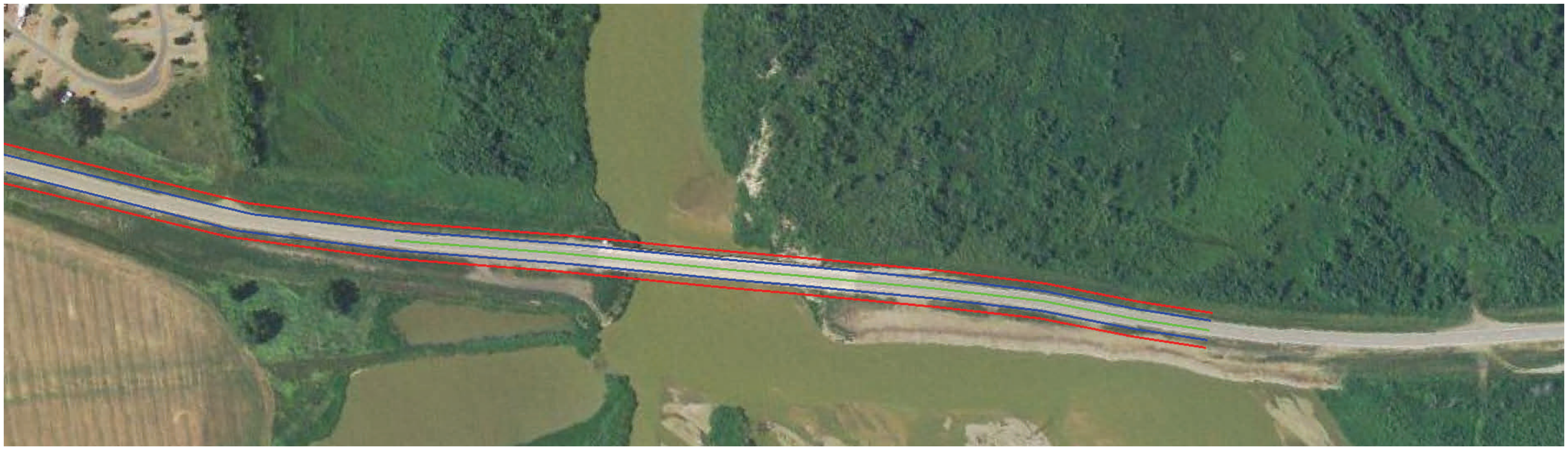
71 dBA

2C

Niobrara East and West

Alternative 2

N



2D

66 dBA

71 dBA

Niobrara East and West

Alternative 2

N

2E

66 dBA

71 dBA

Niobrara East and West

Alternative 2

N

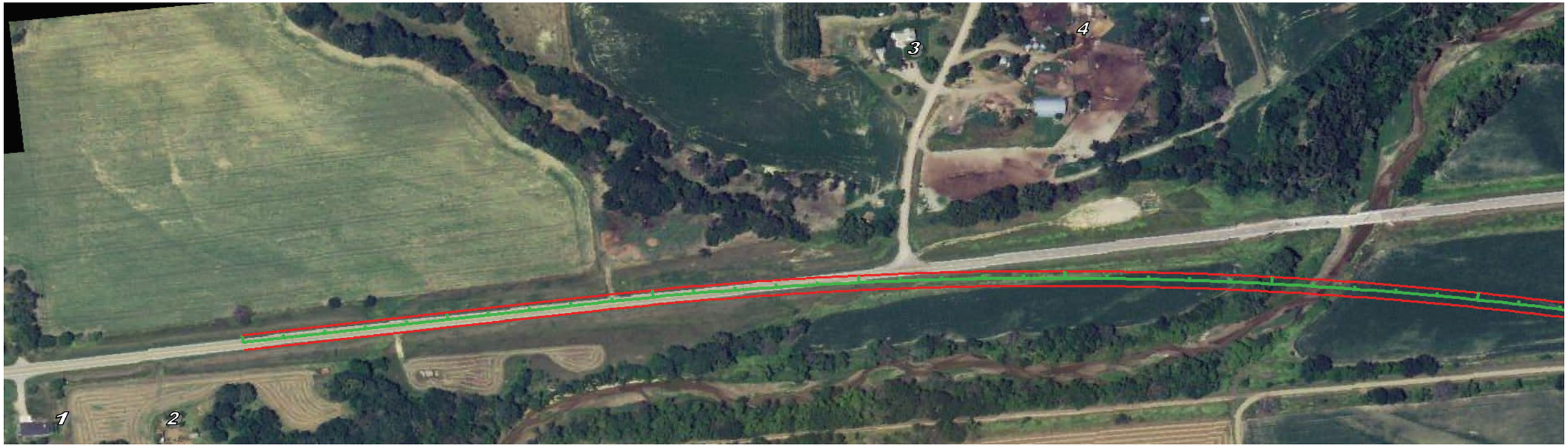
2F

66 dBA

71 dBA

Niobrara East and West

Alternative 3



N

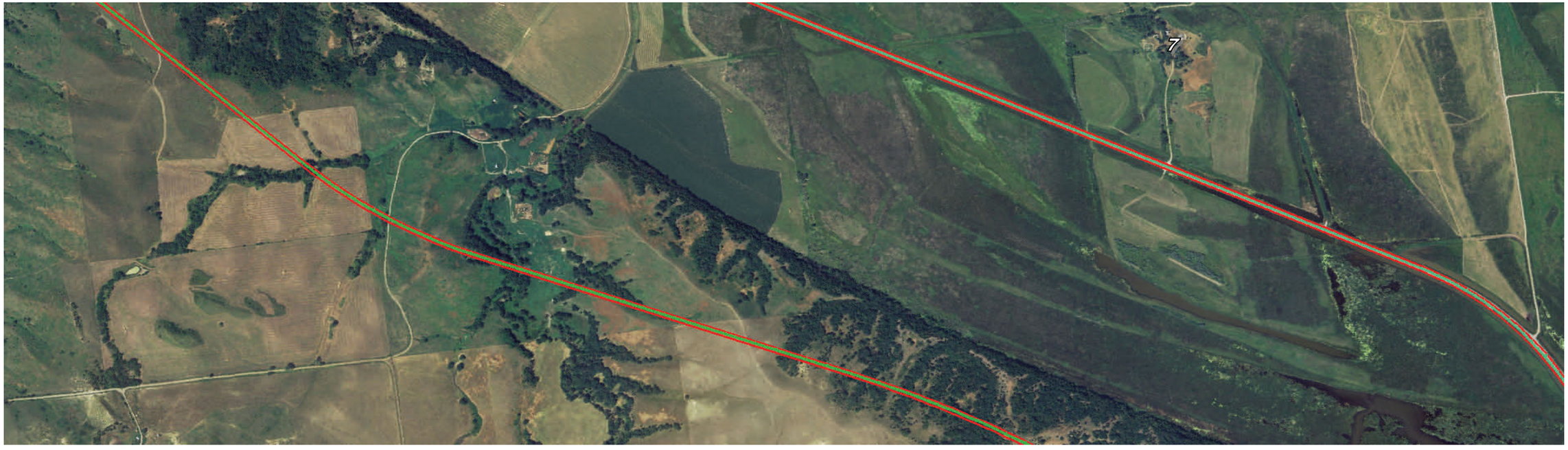
3A

66 dBA

71 dBA

Niobrara East and West

Alternative 3



N

3B

66 dBA

71 dBA

Niobrara East and West

Alternative 3

N

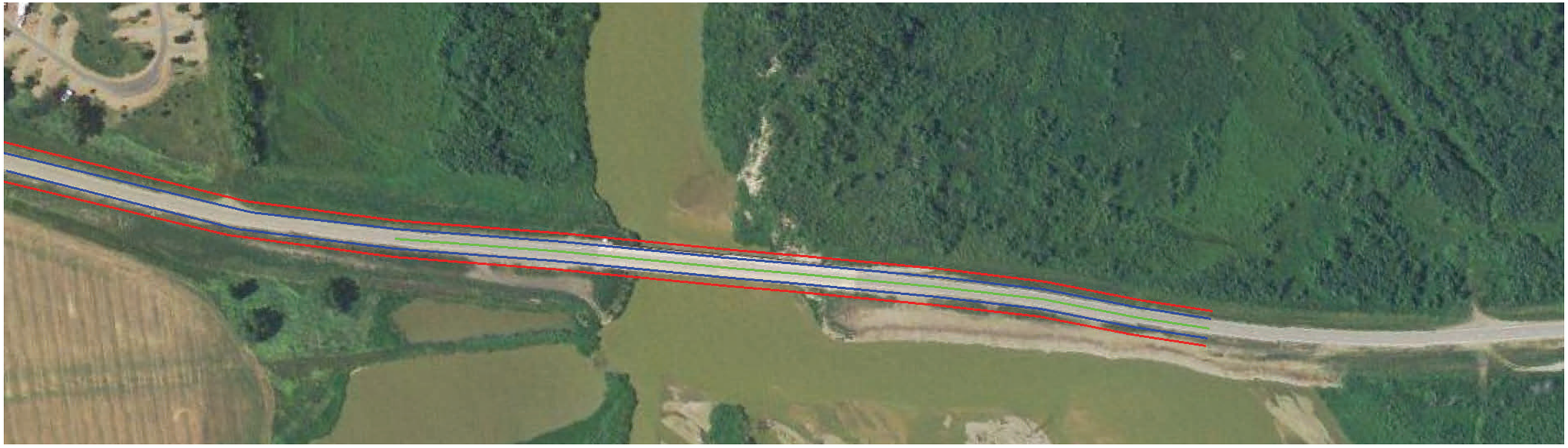
66 dBA

71 dBA

3C

Niobrara East and West

Alternative 3



N

3D

66 dBA

71 dBA

Niobrara East and West

Alternative 3

66 dBA

71 dBA

3E

Niobrara East and West

Alternative 3

N

66 dBA

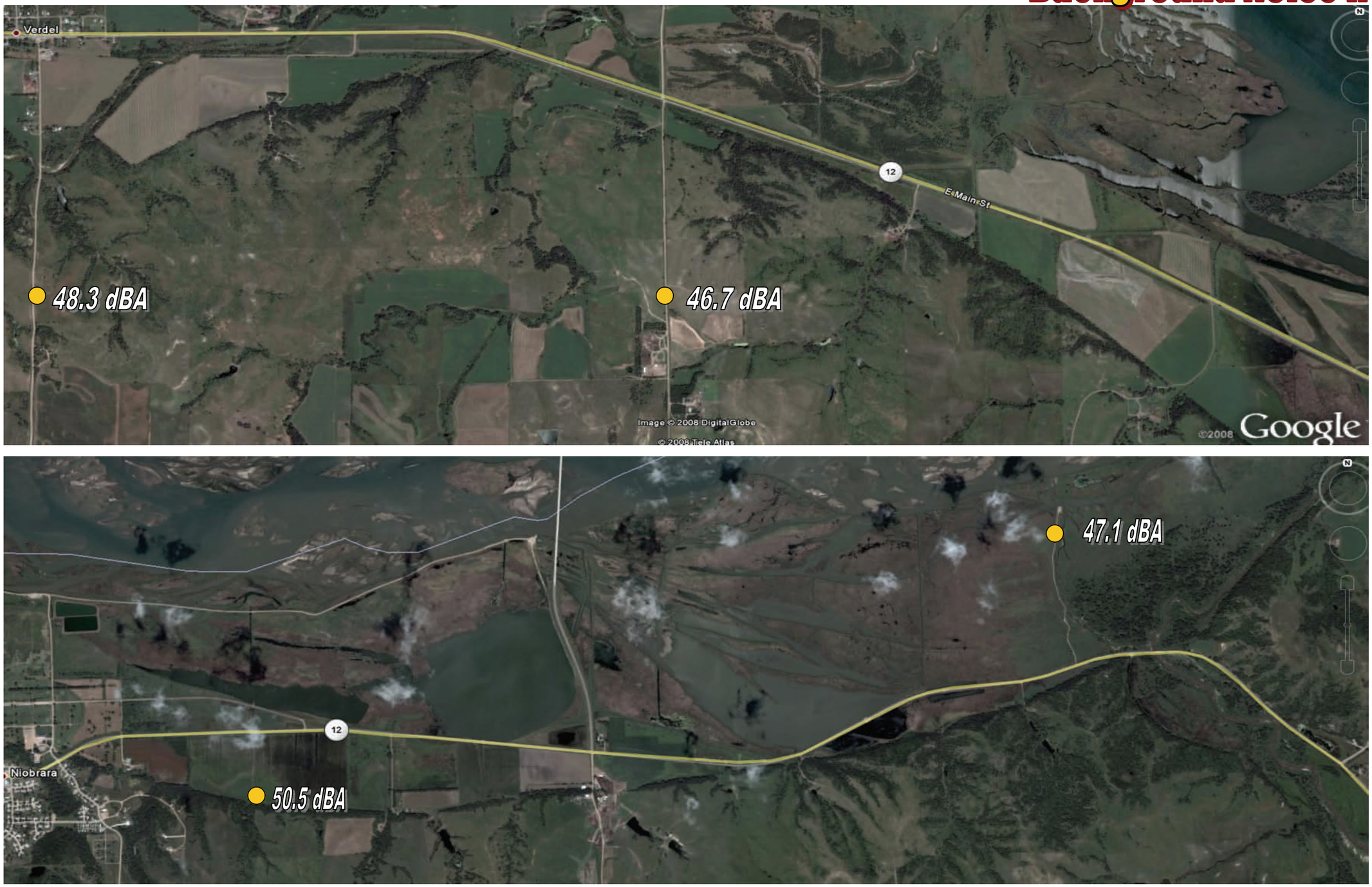
71 dBA

3F

Niobrara East and West

Background Noise Readings

N



4A

● Noise Meter Location

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